

What is claimed is:

1. A base station apparatus comprising:
  - a scheduler that determines a schedule to transmit transmission data to communication terminal apparatuses based on communication quality for subcarrier blocks obtained by dividing a multicarrier communication band into a plurality of portions;
  - a subcarrier block selection section that arranges transmission data in subcarrier blocks whose communication quality is equal to or higher than predetermined quality for the respective communication terminal apparatuses;
  - a frequency hopping section that subjects transmission data to frequency hopping in predetermined time units and arranges the transmission data in subcarriers in the subcarrier blocks; and
  - a transmission section that transmits the transmission data arranged in the subcarriers.
- 20 2. The base station apparatus according to claim 1, wherein said subcarrier block selection section subjects the subcarrier blocks to hopping in predetermined time units.
- 25 3. A communication terminal apparatus comprising:
  - a subcarrier block extraction section that separates a received signal into subcarrier blocks obtained by dividing a multicarrier communication band

into a plurality of portions;

      a reproduction section that reproduces a received signal subjected to hopping within the subcarrier blocks;

      a CIR measuring section that measures a CIR of the received signal;

5      a CQI generation section that generates CQI indicating a transmission rate requested based on said CQI; and

      a transmission section that transmits said CQI.

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4. The communication terminal apparatus according to claim 3, wherein said CIR measuring section comprises:

      a signal power calculation section that calculates power of desired signals from the received signal in subcarrier block units;

15      an interference power calculation section that calculates power of interference signals from the received signal in subcarrier block units;

      an averaging section that calculates an average value of power of interference signals in a plurality of subcarrier blocks; and

20      a CIR calculation section that calculates a CIR from power values of said desired signals and average power value of said interference signals in subcarrier block units.

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5. A radio communication method comprising the steps of:

determining a schedule for transmitting transmission data to a plurality of communication terminal apparatuses based on CQI transmitted from the respective communication terminal apparatuses;

5        calculating communication quality for the communication terminal apparatuses in units of subcarrier blocks obtained by dividing a multicarrier communication band into a plurality of portions, arranging transmission data in subcarrier blocks whose communication quality is equal to or higher than predetermined quality for the respective communication terminal apparatuses;

10      arranging the transmission data subjected to frequency hopping in predetermined time units in subcarriers in the subcarrier blocks and transmitting the transmission data arranged in the subcarriers;

15      separating the received signal into subcarrier blocks obtained by dividing a multicarrier communication band into a plurality of portions;

          reproducing the received signal subjected to hopping in the subcarrier blocks; and

20      measuring a CIR of the received signal, generating CQI indicating a transmission rate requested based on said CIR and transmitting said CQI.

## ABSTRACT

In order to reduce interference between cells through hopping and use frequencies in a good propagation situation, a scheduler section 102 carries out scheduling 5 for determining to which user data should be sent using CQI from each communication terminal apparatus, selects a user signal to be sent in the next frame and determines in which subcarrier block the data should be sent. An MCS decision section 103 selects a modulation scheme and 10 coding method from the CQI of the selected user signal. A subcarrier block selection section 110 selects a subcarrier block instructed by the scheduler section 102 for each user signal. For the respective subcarrier 15 blocks, FH sequence selection sections 111-1 to 111-n select hopping patterns. A subcarrier mapping section 112 maps the user signal and control data to subcarriers according to the selected hopping pattern.

[FIG.1]

TRANSMISSION DATA (USER 1)  
TRANSMISSION DATA (USER 2)  
TRANSMISSION DATA (USER 3)

5 CQI FROM MOBILE STATION  
11 SCHEDULER SECTION  
12 CODING SECTION  
13 TRANSMISSION HARQ SECTION  
14 MODULATION SECTION

10 CONTROL DATA  
15 CONTROL DATA PROCESSING SECTION  
16 CODING SECTION  
17 MODULATION SECTION  
FH PATTERN

15 18 MULTIPLEXING SECTION  
19 SUBCARRIER MAPPING SECTION  
PILOT SIGNAL  
20 S/P CONVERSION SECTION  
21 IFFT SECTION

20 22 GI INSERTION SECTION  
23 RADIO PROCESSING SECTION

[FIG.2]

RM PARAMETER  
25 21 BUFFER  
22 RATE MATCHING

[FIG.3]

1 BLOCK (= N SUBCARRIERS)  
FREQUENCY  
TIME (SYMBOL)  
PILOT  
5 DATA

[FIG.4]

51 RADIO PROCESSING SECTION  
52 GI ELIMINATION SECTION  
10 53 FFT SECTION  
FH PATTERN  
54 SUBCARRIER DEMAPPING SECTION  
55 CHANNEL SEPARATION SECTION  
56 DEMODULATION SECTION  
15 57 DECODING SECTION  
CONTROL DATA  
58 DEMODULATION SECTION  
59 RECEPTION HARQ SECTION  
60 DECODING SECTION  
20 USER DATA  
62 CIR MEASURING SECTION  
64 TRANSMISSION SECTION  
63 CQI GENERATION SECTION  
61 ACK/NACK GENERATION SECTION  
25

[FIG.5]

TRANSMISSION DATA (USER 1)  
TRANSMISSION DATA (USER 2)

TRANSMISSION DATA (USER 3)

102 SCHEDULER SECTION

101 RECEPTION SECTION

103 MCS DECISION SECTION

5 MCS INFORMATION

104-1 CODING SECTION

104-2 CODING SECTION

105-1 TRANSMISSION HARQ SECTION

105-2 TRANSMISSION HARQ SECTION

10 106-1 MODULATION SECTION

106-2 MODULATION SECTION

SUBCARRIER BLOCK INFORMATION

CONTROL DATA

108 CODING SECTION

15 109 MODULATION SECTION

107 CONTROL DATA PROCESSING SECTION

110 SUBCARRIER BLOCK SELECTION SECTION

FH SEQUENCE

111-1 FH SEQUENCE SELECTION SECTION

20 111-2 FH SEQUENCE SELECTION SECTION

111-n FH SEQUENCE SELECTION SECTION

PILOT SIGNAL

112 SUBCARRIER MAPPING SECTION

113 S/P CONVERSION SECTION

25 114 IFFT SECTION

115 GI INSERTION SECTION

116 RADIO PROCESSING SECTION

[FIG. 6]

SUBCARRIER BLOCK  
FREQUENCY  
1 FRAME  
5 ASSIGNMENT TO USER 1  
ASSIGNMENT TO USER 2  
ASSIGNMENT TO CONTROL DATA

[FIG. 7]

10 201 RADIO PROCESSING SECTION  
202 GI ELIMINATION SECTION  
203 FFT SECTION  
SUBCARRIER BLOCK ASSIGNMENT INFORMATION  
204 SUBCARRIER BLOCK EXTRACTION SECTION  
15 FH SEQUENCE ASSIGNMENT INFORMATION  
205-1 DATA SEQUENCE REPRODUCTION SECTION  
205-2 DATA SEQUENCE REPRODUCTION SECTION  
206-1 DEMODULATION SECTION  
206-2 DEMODULATION SECTION  
20 207 DECODING SECTION  
CONTROL DATA  
208 RECEPTION HARQ SECTION  
209 DECODING SECTION  
211 PILOT SIGNAL EXTRACTION SECTION  
25 212 CIR MEASURING SECTION  
214 TRANSMISSION SECTION  
213 CQI GENERATION SECTION  
210 ACK/NACK GENERATION SECTION

USER DATA

CRC RESULT

[FIG. 8]

5 EACH BLOCK PILOT SIGNAL  
CALCULATION UNIT FOR EACH BLOCK  
301-1 SIGNAL POWER CALCULATION SECTION  
302-1 INTERFERENCE POWER CALCULATION SECTION  
303-1 CIR CALCULATION SECTION  
10 301-2 SIGNAL POWER CALCULATION SECTION  
302-1 INTERFERENCE POWER CALCULATION SECTION  
303-2 CIR CALCULATION SECTION  
301-3 SIGNAL POWER CALCULATION SECTION  
302-3 INTERFERENCE POWER CALCULATION SECTION  
15 303-3 CIR CALCULATION SECTION  
BLOCK 1 CIR  
BLOCK 2 CIR  
BLOCK 3 CIR

20 [FIG. 9]

TRANSMISSION DATA (USER 1)  
TRANSMISSION DATA (USER 2)  
TRANSMISSION DATA (USER 3)  
102 SCHEDULER SECTION  
25 101 RECEPTION SECTION  
103 MCS DECISION SECTION  
104-1 CODING SECTION  
104-2 CODING SECTION

## MCS INFORMATION

105-1 TRANSMISSION HARQ SECTION  
105-2 TRANSMISSION HARQ SECTION  
106-1 MODULATION SECTION  
5 106-2 MODULATION SECTION  
SUBCARRIER BLOCK INFORMATION  
CONTROL DATA (SPEECH DATA)  
411 CODING SECTION  
412 MODULATION SECTION  
10 401 CONTROL DATA PROCESSING SECTION  
403 SUBCARRIER BLOCK HOPPING SEQUENCE GENERATION  
SECTION  
402 SUBCARRIER BLOCK SELECTION SECTION  
FH SEQUENCE  
15 111-1 FH SEQUENCE SELECTION SECTION  
111-2 FH SEQUENCE SELECTION SECTION  
111-n FH SEQUENCE SELECTION SECTION  
PILOT SIGNAL  
112 SUBCARRIER MAPPING SECTION  
20 113 S/P CONVERSION SECTION  
114 IFFT SECTION  
115 GI INSERTION SECTION  
116 RADIO PROCESSING SECTION  
  
25 [FIG.10]  
SUBCARRIER BLOCK  
SUBCARRIER BLOCK HOPPING FOR CONTROL DATA  
FREQUENCY

1 FRAME

ASSIGNMENT TO USER 1

ASSIGNMENT TO USER 2

ASSIGNMENT TO CONTROL DATA

5

[FIG.11]

PILOT SIGNAL FOR EACH BLOCK

CALCULATION UNIT FOR EACH BLOCK

301-1 SIGNAL POWER CALCULATION SECTION

10 302-1 INTERFERENCE POWER CALCULATION SECTION

301-2 SIGNAL POWER CALCULATION SECTION

302-1 INTERFERENCE POWER CALCULATION SECTION

301-3 SIGNAL POWER CALCULATION SECTION

302-3 INTERFERENCE POWER CALCULATION SECTION

15 601 INTERFERENCE POWER AVERAGING SECTION

602-1 CIR CALCULATION SECTION

602-2 CIR CALCULATION SECTION

602-3 CIR CALCULATION SECTION

BLOCK 1 CIR

20 BLOCK 2 CIR

BLOCK 3 CIR

[FIG.12]

FADING POWER

25 OPERATING FREQUENCY BAND

[FIG.13]

FADING POWER

## OPERATING FREQUENCY BAND

[FIG.14]

1 BLOCK  
5 1 BLOCK  
CELL A  
CELL B  
CELL C  
BLOCK SIZE INFORMATION  
10 1 BLOCK  
CONTROL STATION

[FIG.15]

851 DELAY INFORMATION RECEPTION SECTION  
15 852 BLOCK SIZE DETERMINING SECTION  
853 TRANSMISSION SECTION  
802 DELAY VARIANCE CALCULATION SECTION  
803 BLOCK SIZE INFORMATION RECEPTION SECTION  
801 RECEPTION SECTION  
20 TRANSMISSION DATA (USER 1)  
TRANSMISSION DATA (USER 2)  
TRANSMISSION DATA (USER 3)  
804 SCHEDULER SECTION  
103 MCS DECISION SECTION  
25 104-1 CODING SECTION  
104-2 CODING SECTION  
MCS INFORMATION  
105-1 TRANSMISSION HARQ SECTION

105-2 TRANSMISSION HARQ SECTION  
106-1 MODULATION SECTION  
106-2 MODULATION SECTION  
805 SUBCARRIER BLOCK SELECTION SECTION  
5 FH SEQUENCE  
111-1 FH SEQUENCE SELECTION SECTION  
111-2 FH SEQUENCE SELECTION SECTION  
111-n FH SEQUENCE SELECTION SECTION  
112 SUBCARRIER MAPPING SECTION  
10 SUBCARRIER BLOCK INFORMATION  
CONTROL DATA  
108 CODING SECTION  
109 MODULATION SECTION  
107 CONTROL DATA PROCESSING SECTION  
15 PILOT SIGNAL  
113 S/P CONVERSION SECTION  
114 IFFT SECTION  
115 GI INSERTION SECTION  
116 RADIO PROCESSING SECTION